

ON *DELIAS BELLADONNA* AND ALLIED SPECIES (LEP. RHOP.)

By DR. KARL JORDAN.

(With eight Text-figures.)

THE history of *Delias belladonna* Fabr. (1793) and allies, from the point of view of the systematist, is an unbroken chain of errors. It did not start well. Fabricius described *D. belladonna* from Jones's drawings, but could not give the locality whence the specimen had come; and the more detailed description and the figure of this specimen published by Donovan in 1823 differ in important points from everything we have seen in collections. Subsequent authors, nevertheless, have applied the name to North Indian or to Chinese specimens. Since 1823 a considerable number of forms similar to *D. belladonna* have been published; some were described as distinct species, and afterwards, erroneously, sunk as varieties or even synonyms, and others were described as varieties, but in reality are distinct species or are varieties of other species than those to which they were originally assigned. The acquisition of larger collections from the Himalayan countries and China appeared to prove the distinctions between the various species and varieties to be very fluctuating, and, the real distinctions not being known, the consequence was great uncertainty and confusion. Elwes (1888) and Butler (1897) drew the logical conclusion that, the differences being unreliable, all the forms known to them belonged to one single species.

The latest account we have of *D. belladonna* and allies is that by Fruhstorfer in Seitz, *Macrolep.* ix, p. 130 (1911). Here Butler's view is adopted. The account bears evidence of being written in haste and not revised.

My assistant, Mr. F. W. Goodson, recently had an occasion to inspect the magnificent series of Oberthür's *Delias*, now in the collection of Mr. John Levick, of Birmingham, and on comparing the large number of specimens of the various so-called varieties of *D. belladonna* from the Oberthür collection, he came to the conclusion that the specimens could be arranged in definite groups which had the appearance of being distinct species. As the opinions expressed by Lepidopterists on the systematics of *D. belladonna* and allies were mainly based on the colour and pattern of these butterflies and often differed greatly, it was necessary for me to study the structure of the various forms so as to arrive at conclusions independent of differences in colour and pattern. Owing to the pressure of other work the following notes are somewhat cursory, but as they put the systematics of *D. belladonna* nevertheless on a firmer basis, they seem to me worth publishing. The next step would be to find structural differences between the ♀♀ of the various species of the *belladonna*-group.

The table on page 278 gives a survey of the distinct species and their distribution as far as known to me.

The species are confined to the mountains. In *Iris*, p. 4 (1924), a ♂ is recorded from Pekin, but I doubt that this single specimen really came from so far north. It will be noticed that no less than 5 species are found in Yunnan, and that *D. belladonna* occurs in all districts except Central China and Formosa. Some of the species and varieties were originally described as new on account

	D. lativitta.	D. patrua.	D. subnubila.	D. wilemani.	D. sanaca.	D. berinda.	D. belladonna.
N.W. India.	—	—	—	—	×	—	×
Nepal	—	—	—	—	—	—	×
Sikkim (higher alt.)	—	—	—	—	×	×	×
Sikkim (lower alt.)	—	—	—	—	—	—	×
Assam	—	—	—	—	—	×	×
Burma	?	—	—	—	×	×	×
Yunnan	×	×	×	—	×	—	×
W. China	×	—	×	—	—	×	×
C. China	—	×	—	—	—	×	—
Formosa	×	—	—	×	—	—	—
Tenasserim	—	—	—	—	—	—	×
Sumatra	—	—	—	—	—	—	×
Celebes	—	—	—	—	—	—	×

of the deep tint of the orange markings ; I think Butler (1897) was quite right in looking upon such specimens as discoloured.

The various species can be distinguished without much trouble by differences in the anal tergite of the ♂. After the claspers have been softened (by hot water), they can be sufficiently separated to allow the anal tergite to be inspected. This segment is trifid (text-figs. 1-6) in all the species, but its proportions differ in the various species. The clasper is here a less safe guide ; its structure, however, is nevertheless very interesting. It bears on the inner surface below the middle a rounded hole (text-figs. 7, 8, 9) leading into the hollow interior of the clasper. This interior cavity is lined with a membrane bearing hair-like projections and being raised into a number of longitudinal folds of various lengths. The surface of the folds is formed by chitinised filaments united in a more or less regular network giving the folds the appearance of a sponge. The hole or "groove" is larger in some species than in others. Above it there is a ridge produced into a tubercle (*t*) of varying height, smooth and feebly chitinised. This ridge evidently acts as a guide towards or from the groove. The whole organ here described is doubtless of a glandular nature. In the ♀ there is at each side of the genital orifice a thick bundle of stiff hairs, which may possibly have developed in connection with the peculiar inner structure of the ♂-claspers.

The plume-scales of the ♂♂ are not identical in all the species, and one species (*D. belladonna*) has in the ♂ a much more regularly scaled (less rough) upper surface than the others.

Key to the species :

1. Terminal fringe of forewing to a large extent white 2.
 Terminal fringe of forewing with a very few or no white
 scales 3.
2. Yellow basal costal patch of hindwing above reduced to
 a narrow streak or absent *D. patrua*.
 Yellow basal costal patch of hindwing above large *D. lativitta*.
3. Patch in cell of hindwing below entirely yellow, sometimes
 very small ; on upperside the cell of hindwing in both
 sexes without long white streak *D. belladonna*.
 Patch in cell of hindwing beneath proximally white ; in ♀
 the cell of hindwing above always with conspicuous
 white or greyish white streak 4.

4. Hindwing above with a large orange patch between M^1 and M^2 *D. wilemani*.
 Discal spot M^1 — M^2 of hindwing above white, or at most suffused with yellow 5.
5. Anal tergite of ♂ long and narrow, the lateral prongs quite short *D. subnubila*.
 Anal tergite distally rounded-dilated, the lateral prongs long 6.
6. Median prong of anal tergite of ♂ shorter than lateral ones *D. sanaca*.
 Median prong a little longer than lateral ones *D. berinda*.

The small Sumatran *chrysorrhoea* belongs to *D. belladonna* ; the form from Celebes, which we do not know, probably is a further development of the same branch.

1. *Delias patrua* Leech (1890).

Delias patrua Leech, *Entom.* xxiii, p. 46 (1890) (Chang-yang) ; id., *Butt. China*, ii, p. 442, pl. xxxvii, fig. 1 ♂, 2 ♀ (1893).

Delias belladonna var. 11. *D. patrua* Leech, Butler, *Ann. Mag. N.H.* (6), xx, p. 162 (1897).

♂ ♀. Discal streaks of both wings narrow above and below ; yellow costal basal patch on upperside of hindwing reduced to a narrow costal streak, which is often more grey than yellow ; yellow abdominal area canary-yellow with a tint of sulphur, being much paler above than beneath. On underside, the diffuse cell-streak of the forewing subapically not interrupted, its apical portion not forming a transverse patch ; basi-costal orange patch of hindwing narrow, not touching the cell.

♂. Upper scales of upper surface nearly all bidentate (apart from the rounded scales in the costal and abdominal areas of hindwing), the teeth about as long as the scale is broad at the base of the teeth. Anal tergite (text-fig. 1) strongly widened distally, the prongs short, the median one thin, the lateral ones broad, a little shorter than the diameter of the sinus measured from the tip of the lateral prong to the tip of the median one ; the median prong on a slightly higher level at apex and usually somewhat shorter than the lateral prongs. Apex of clasper usually forming a rather long nose ; tubercle of inner surface high, but obtuse ; groove large.

Hab. Central China and Yunnan.

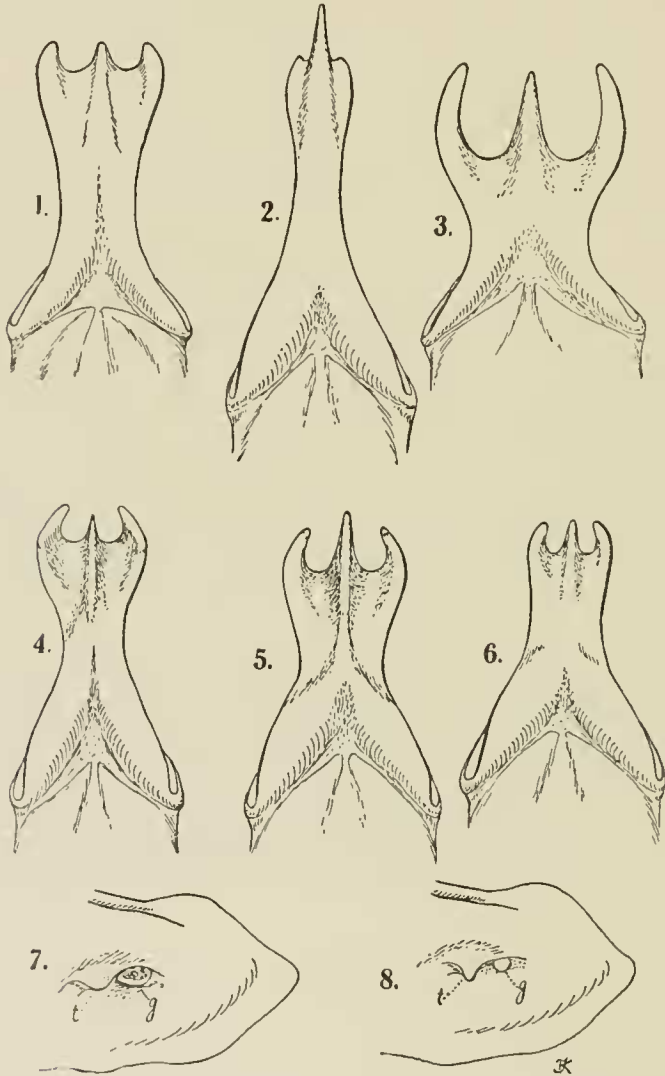
2. *Delias lativitta* Leech (1893).

Delias patrua var. *lativitta* Leech, *Butt. China*, ii, p. 422, pl. xxxv, fig. 1 ♂ (1893) (Ta-tsien-lu and Moupin).

Delias patrua Leech var. *formosana* Matsumura, *Ent. Zeitschr.* xxiii, p. 92 (1909) (♀, Formosa).

♂ ♀. Terminal fringes of both wings for the greater part white, which does not occur in any of the following species, the fringes remaining black even in the palest specimens of *D. sanaca*. On upperside the stripes almost pure white in ♂, the cell-stripe of the hindwing particularly being very prominent, in the ♀ the stripes somewhat shaded with black-brown ; in other species with a cell-stripe on the upperside of the hindwing this stripe is much larger and more distinct in ♀ than in ♂ ; anterior discal spot of hindwing of ♂, above, as well marked as the four other discal spots, in other species this anterior discal spot diffuse in ♂

or absent, but always present in ♀, in *D. lativitta* on the contrary more diffuse in ♀ than in ♂. On underside all specimens with an orange costal streak before vein SC^2 ; subbasal orange costal patch not touching cell and SC^2 ; white cell-streak of forewing distally divided longitudinally into three lines, the



subapical portion of the streak not separated as an oblique transverse patch, which is the case in all the following species.

♂. Scaling similar to that of *D. patrua*. Anal tergite (text-fig. 3) much broader than in *D. patrua*, the prongs much longer and the lateral ones narrower. Tubercle of clasper more triangular; groove somewhat smaller, more circular.

Hab. West China; Yunnan; Formosa.

The specimen from Burma mentioned by Leech as identical with *lativitta*

possibly was the ♀ of *D. sanaca perspicua*. I cannot find any difference between ♂♂ from Formosa (we have no Formosan ♀♀) and from West China.

3. *Delias subnubila* Leech (1893).

Delias sanaca var. *subnubila* Leech, *Butt. China*, ii, p. 421, pl. xxxvii, fig. 7 ♂, 8 ♀ (1893) (W. China).

♂ ♀. Terminal fringes black. On upperside the anterior submarginal spots anguliform, not linear as in the two preceding species; orange basal spot of hindwing touching cell and SC², discal spots shorter than in the previous species, cell-spot short in ♂, long, broad, and very conspicuous in ♀, not being shaded with blackish in ♀. orange abdominal area slightly deeper in tone than in *D. lativitta*. On underside the white diffuse cell-streak of forewing subapically more or less constricted or nearly interrupted, its apical portion forming an oblique transverse patch, which, in ♀, is also distinct on upperside.

♂. Scaling in middle of upperside much rougher than in the two previous species, the upper scales longer, more deeply sinuate and more or less curved upwards, plumules broader proximally. Anal tergite (text-fig. 2) very different from that of every other allied species: long, narrow, feebly dilated distally, the lateral prongs quite short and ventral, *D. subnubila* representing the one extreme in the development of the anal tergite and *D. lativitta* the other. Tubercle of clasper somewhat lower than in *D. lativitta* and the groove much larger.

Hab. West China and Yunnan; may be expected to occur in N.E. Burma.

4. *Delias wilemani* spec. nov.

Delias taiwana Wileman (partim), *Annot. Zool. Japon.* vii, p. 95, No. 38 (1909) (♀; ♂ = *Aporia moltrechti* Oberth. 1909, January).

♂ not known.

♀. Differs from *D. subnubila* and all the other species in the hindwing bearing between the median veins a large, triangular, chrome-yellow, discal patch which is only 1 to 2 mm. distant from the submarginal spot and nearly extends to the cell; this patch corresponds to the last discal patch of the allied species, but is much larger, abdominal area chrome-yellow between M² and SM¹ from near termen more than half-way to base; subapical oblique white cell-patch in forewing, upperside, rather sharply defined, and much more distinct than in the ♀♀ of the three previous species.

Hab. Formosa: Arizan, 2 ♀♀ in coll. Wileman, incl. of *type*; Horisha, 1 small ♀ in Mus. Tring.

5. *Delias sanaca* Moore (1857).

Pieris sanaca Moore, *Proc. Zool. Soc. Lond.*, p. 103, pl. xlv, fig. 4 ♀ (1857) ("Darjiling" error).

Delias belladonna var. 3, *D. sanaca* = *chrysorrhoea*, Butler, *Ann. Mag. N.H.* (6), xx, p. 161 (1897) ("Darjiling" error, Kulu).

Delias belladonna Falr., Mackinnon and Nicév., *Journ. Bombay N.H. Soc.* xi, p. 585, No. 216 (1898) (partim).

The light-coloured specimens from N.W. India are easily distinguished from all the other species, but the specimens with the white markings not enlarged can only be recognised with certainty as belonging to *D. sanaca* by the examination of the structure. Differs from the various forms of *D. belladonna* in the cell-spot of the hindwing below being white proximally and in the cell of the hindwing above bearing in the ♀ a long grey streak; from similar specimens of

D. berinda in the third discal spot of the hindwing being shorter and proximally more or less concave.

♂. Anal tergite (text-fig. 4) similar to that of *D. patrua*, apically more strongly rounded-dilated and distinctly curved down, the lateral prongs curved, median prong much thinner and always shorter than the lateral ones, median carina high. Tubercle of clasper low, groove very large. Scaling on disc of upperside shorter than in *D. berinda*.

Hab. N.W. India, Sikkim, Burma, and Yunnan, in two subspecies.

a. D. sanaca sanaca Moore (1857).

Pieris sanaca Moore, l.c.

Delias flavalba Marshall, *Proc. Zool. Soc. Lond.*, p. 759 (1882).

Delias sanaca Moore, *Lep. Ind.* vi, p. 163, pl. dxxviii, fig. 1, *a, b, ♂, c, d, e, ♀* (1904) (W. Himalayas).

Very variable, the palest specimens (*f. flavalba*) being white marked with black, and the darkest being black spotted with white in the usual way. The dark specimens resemble *D. belladonna horsfieldi*, which occurs in the same district and with which they have often been confounded; the yellow cell-spot of the hindwing, beneath, is always white proximally, and in the ♀ the cell of the hindwing, above, is for the greater part white.

Hab. N.W. India.

b. D. sanaca perspicua Fruhst. (1911).

Delias belladonna auct. partim.

Delias belladonna var. *horsfieldi* Gray, Elwes (err. determinationis), *Trans. Ent. Soc. Lond.* p. 409, no. 359, pl. x, fig. 3 ♀ (1888) (text partim, Sikkim).

Delias horsfieldi Gray, Moore (err. determinat.), *Lep. Ind.* vi, p. 166 (1904) (partim).

Delias belladonna perspicua Fruhstorfer, in Seitz, *Macrolep.* ix, p. 130, pl. lvi, *a. ♀* (1911) (Upper Burma).

I take the figure in Seitz as type of the name *perspicua*, the figure representing a ♀ of the present subspecies; but the description, particularly of the ♀, and the statement that of all the Chinese forms *zelima* is the one most similar to *perspicua*, point to *D. belladonna* rather than to the present subspecies of *D. sanaca*.

Resembles very closely *D. berinda boyleae*, with which it occurs together, but the anal tergite and the scaling of the upperside different, as stated above; in *boyleae* (not *boylei*!) the third discal spot on the underside of the hindwing proximally drawn out into a thin streak, in *perspicua* truncate or emarginate. Intergrades with *D. sanaca sanaca*.

Hab. Sikkim (at altitudes above 1,800 m.), N.E. Burma, and Yunnan.

6. *Delias berinda* Moore (1872).

Thyca berinda Moore, *Proc. Zool. Soc. Lond.*, p. 566 (1872) (Khasia Hills).

This is the oldest name of the species to which belong *adelma*, *berinda*, and *boyleae*. The true status of *berinda* and *boyleae* has never been perceived. Moore himself and Elwes, de Nicéville, Swinhoe, Fruhstorfer, Butler, etc., confounded *berinda* with the dark forms of *D. belladonna* occurring in Lower Sikkim, Assam, and N.W. Burma, and *boyleae* has usually been regarded as an individual aberration (discoloured) of *D. belladonna*.

The three subspecies differ much from each other in colouring; all are

distinguished from the forms of *D. belladonna* by the cell-patch of the hindwing being white proximally on the underside and, in the ♀, being represented on the upperside by a long white streak. Two of the subspecies are easily differentiated from *D. sanaca* and *D. subnubila*, while the third closely agrees in pattern with *D. sanaca perspicua*, cf. above.

♂. Upper scales in centre of wings, upperside, longer than in *D. sanaca*, more or less strongly curved up, rendering the wing-surface rough. Anal tergite (text-fig. 5) nearly as in *D. sanaca*, but the median prong broader and at least as long as the lateral ones. Tubercle and groove of clasper (text-fig. 7) essentially as in *D. sanaca*, the groove slightly smaller.

Hab. Sikkim, Assam, Burma, Yunnan, West and Central China.

a. *D. berinda berinda* Moore (1872).

Thyca berinda Moore, l.c. (Khasia Hills).

Delias ithiela Butler, Moore (err. determinat.), *Butt. Ind.* vi, p. 167, pl. DXXX, fig. 1b ♀ (1904) (text partim; fig. of type).

Delias belladonna auct. partim.

True *berinda* is evidently rare in collections; it is in general appearance similar to the black forms of *D. belladonna*. On the upperside the white markings are much reduced in size, and the orange anal area of the hindwing is absent; the ♀ has a sharply defined, long, but narrow white streak in the cell of the hindwing. On the underside the markings are likewise small, the orange basal patch of the hindwing is shortened, being sometimes elliptical, and the abdominal area black, without orange.

Hab. Assam; Khasia Hills, N.E. Burma; Barak Valley, W. Manipur, iv; S. Chin Hills, 2,200 m. (Watson).

b. *D. berinda boyleae* Butl. (1885).

Delias boyleae Butler, *Ann. Mag. N.H.* (5), xv, p. 58 (1885) (Darjiling).

Delias horsfieldi Gray, Elwes (err. determinat.), *Ann. Mag. N.H.* (5), xvii, p. 158 (1886) (partim); Moore, *Lep. Ind.* vi, p. 166 (1904) (partim).

Delias belladonna Fabr., Elwes (err. determinat.), *Trans. Ent. Soc.*, p. 408 (1888) (partim).

Delias belladonna var. *amarantha* Mitis, *Iris*, vi, p. 133, pl. ii, fig. 3 ♂ (1893) (Darjiling, coll. Staudinger ex Elwes).

Delias belladonna var. 5, *D. boylei* (sic!) = *amarantha*, Butler, *Ann. Mag. N.H.* (6), xx, p. 161 (1897) (partim).

Delias belladonna ab. *boyleae* Butl., Fruhstorfer, in Seitz, *Macrolep.* ix, p. 130 (1911).

Delias belladonna ab. *amarantha* Mitis, Fruhstorfer, l.c.

White spots of upperside larger and less diffuse than in *D. b. berinda*, particularly the discal spots of the hindwing, orange anal area large above and below.

Hab. Sikkim, at higher altitudes. May be expected to occur in N.E. Burma.

c. *D. berinda adelma* Mitis (1893).

Delias belladonna var. *adelma* Mitis, *Iris*, vi, p. 130 (1893) (C. China).

Delias sanaca var. *adelma* Mitis, Lecch, *Butt. China*, ii, p. 421, pl. xxxvii, fig. 5 ♂, 6 ♀ (1894) (Chang-yang, vi, vii).

Delias belladonna var. 10, *D. adelma*, Butler, *Ann. Mag. N.H.* (6), xx, p. 162 (1897).

Upperside of ♂ very dark, the markings grey, the discal stripes narrow, diffuse, orange area of hindwing large and conspicuous, in cell of hindwing a

thin white line ; in ♀ the markings of the forewing likewise small, diffuse, on the hindwing large, particularly the long cell-spot, abdominal area grey, the grey streak along submedian fold long and usually somewhat washed with yellow. On underside the orange markings of hindwing large in both sexes, basal costal patch pointed distally.

Hab. Central and West China. May be expected to occur in Yunnan.

7. *Delias belladonna* Fabr. (1793).

Papilio Heliconius belladonna Fabricius, *Ent. Syst.* iii, p. 180, No. 557 (1893) (hab. ?).

Papilio belladonna Fabr., Donovan, *Natur. Repos. Ent.*, pl. xxxv, ♀ (1823) (hab. ?).

Donovan's figure represents the upperside of a ♀ without a white stripe in the cell of the hindwing. In all the previous species (Nos. 1 to 6) the ♀♀ have a long white cell-stripe.

The subcostal vein of hindwing branches off a little more distally and therefore is more strongly curved than in all other species. The submedian discal double spot on the underside of the forewing more clearly defined than in the allied species, the cell-patch of the hindwing always entirely yellow, not being white proximally, the basal orange patch shortened in nearly all specimens, the discal spot following it usually white, rarely washed with yellow. Cell of hindwing above without white spot or the spot is short, never being so long as in the ♀♀ of other species.

♂. Scaling of upperside much more smooth than in any other species of this group, the upper scales much shorter than, for instance, in *D. berinda*, not so much curved upwards and nearly all tridentate in and around the cell on both wings ; plumules shorter than in *D. berinda*, but proximally nearly as broad, in *D. berinda* five times as long as broad, in *D. belladonna* not quite four times. Anal tergite (text-fig. 6) distally less dilated than in *D. berinda*, the sides of the apical portion less rounded, the three prongs of equal lengths, the median carina less elevate, the depressions extending backwards from the sinus at each side of the median prong shorter. Tubercle of clasper (text-fig. 8) higher and more pointed and the groove smaller than in any other species.

Hab. Himalayas from N.W. India to West China, extending southward to Tenasserim, Sumatra, and Celebes.

a. *D. belladonna belladonna* Fabr. (1793).

Fabricius, l.c. ; Donovan, l.c.

Delias belladonna Fabr., Elwes, *Ann. Mag. N.H.* (5) ♂, xvii, p. 158 (1886).

Elwes, l.c., p. 157, says : " As all the forms of this species are, so far as we know, confined in India to the Himalayas, and no collections from the Himalayas are known to have reached Europe in Fabricius's time, whereas many Chinese insects had been brought to Europe, it would be reasonable to suppose that if a form of *belladonna* occurs in China, and resembles Donovan's plate (which, however, in some respects is evidently inaccurate), the Chinese form would be most probably typical." And on p. 158 : " If, therefore, any insect does exist which is distinct from the Himalayan *horsfieldi* and like Donovan's plate, I should expect it to be found in the mountainous regions of south-western China, perhaps near Canton." If we read south-eastern for south-western, I agree with Elwes. No specimen is known to me from S.E. China, and none

from other localities that agree with Donovan's plate and description. The specimen figured by Donovan is a ♀ which has two yellow spots behind M^2 of the hindwing, one discal, the other submarginal, and both Donovan and Fabricius say that the underside of the hindwing is similar to the upper; Donovan, who expressly states that he has been "more minute in the description of these spots," describes the underside as follows: "The spots being semitransparent the appearance on the underside in a great degree corresponds with that above: there is a small difference, because instead of one yellowish spot at the base of the posterior, there are two, another smaller than that which appears at the base of that wing on the upper surface being situated below it." We must conclude from this description that the submarginal and discal spots on the underside of the hindwing were white as above, not yellow. As two species of this group of *Delias* are known from Formosa, and as in Sikkim *D. belladonna* occurs as low down as 600 mm., there is every likelihood that these *Delias* are also represented in the mountains of south-eastern China. Butler, in *Ann. Mag. N.H.* (5), xv, p. 57 (1885), speaks of a ♂ which agrees with Donovan's figure. There is in the Brit. Mus. an Indian ♀ with the abdomen of a ♂ stuck on which remotely resembles Donovan's figure, as do many ♀♀ of *D. belladonna*.

Hab. ? S.E. China.

b. *D. belladonna zelima* Mitis (1893).

Delias belladonna Fabr., Elwes, *Ann. Mag. N.H.* (5), xvii, p. 158 (1886) (W. Chinese specimens agree with *horsfieldi*); Leech, *Butt. China*, ii, p. 419, pl. xxxvii, fig. 3 ♂, 4 ♀ (1894) (W. China). *Delias belladonna* var. *zelima* Mitis, *Iris*, vi, p. 131 (1893) (W. China). *Delias belladonna* var. 8. *D. horsfieldi = surya* and *zelima*, Butler, *Ann. Mag. N.H.* (6), xx, p. 161 (1897) (partim).

Upperside: Discal spots of hindwing and submarginal spots of both wings large, chrome-yellow anal area of ♂ large, extending about half-way to base, in ♀ smaller, often vestigial only. On underside the spots of both wings and the orange anal area large.

Hab. West China, Yunnan, and north-east Burma.

c. *D. belladonna horsfieldi* Gray (1831).

Pieris horsfieldi Gray, *Zool. Misc.* p. 32 (1831) (Nepal); Kollar, in Hügel, *Kaschmir*, iv, 2, p. 408 (1848) (Massuri). *Pieris belladonna* Gray, *Lep. Ins. Nepal*, p. 7, pl. viii, fig. 2 ♂ (1846). *Delias belladonna* Fabr., Elwes, *Proc. Zool. Soc. Lond.*, p. 401 (1882) (partim); id., *Trans. Ent. Soc.*, p. 408, no. 359 (1888) (partim). *Delias horsfieldi* Gray, Elwes, *Ann. Mag. N.H.* (5), xvii, p. 158 (1886) (partim); Moore, *Lep. Ind.* vi, p. 166, pl. dxxix, fig. 1b ♂, 1c ♀ (1904) (partim). *Delias hearseyi* Butler, *Ann. Mag. N.H.* (5), xv, p. 58 (1885) ("Barrackpore" error). *Delias belladonna* var. *surya* Mitis, *Iris*, vi, p. 132 (1893) ("Kashmir" recte Massuri). *Delias belladonna* var. 8. *D. horsfieldi = surya* and *zelima*, Butler, *Ann. Mag. N.H.* (6), xx, p. 161 (1897) (partim).

Not constantly different from *D. b. zelima*, more variable and as a rule smaller. On upperside the discal spots of forewing usually less diffuse and purer white, the discal spots and cell-patch of hindwing larger. On underside the orange basal patch of hindwing more or less pointed in most specimens. In one of the North-West Indian ♂♂ in the Brit. Mus. there is an orange costal marginal streak on the underside of the hindwing as in *D. lativitta*.

Hab. Sikkim (higher altitudes), Nepal, and North-West India.

d. *D. belladonna ithiela* Butl. (1869).

- Thyca ithiela* Butler, *Ann. Mag. N.H.* (4), iv, p. 242 (1869) ("Penang" error); id., *Lep. Exot.* p. 62, pl. xxiv, fig. 1 (1871).
Delias belladonna Fabr., Elwes, *Proc. Zool. Soc. Lond.*, p. 401 (1882) (Sikkim, partim); id., *Trans. Ent. Soc. Lond.*, p. 408 (1888) (Sikkim, partim).
Delias belladonna var. 9. *D. ithiela* ♂ = *D. berinda* ♀, Butler, *Ann. Mag. N.H.* (6), xx, p. 162 (1897) (*ithiela* = *berinda* ex errore!).
Delias ithiela Butl., Moore, *Lep. Ind.* vi, p. 167, pl. Dxxx, fig. 1, 1a ♂ (1904) (partim, nec fig. 1b, 1c = *berinda*).

White markings reduced in size; orange anal area of hindwing above and below likewise reduced, often absent above, rarely entirely absent beneath.

Hab. Sikkim, at lower altitudes (600 to 1,200 m.).

e. *D. belladonna lugens* subsp. nov.

- Delias belladonna* Fabr., Elwes, *Trans. Ent. Soc. Lond.*, p. 408, no. 359, pl. x, fig. 2 ♀ (1888) (partim; Khasia Hills).
Delias belladonna var. 9. *D. ithiela* ♂ = *D. berinda* ♀, Butler, *Ann. Mag. N.H.* (6), xx, p. 162 (1897) (partim).
Delias ithiela Butl., Moore, *Lep. Ind.* vi, p. 167 (1904) (partim).
Delias belladonna berinda Moore, Fruhstorfer (err. determ.), in Seitz, *Macrolep.* ix, p. 130 (1911) (Assam).

♂ ♀. Not constantly different from *D. b. ithiela*, but the series of specimens darker, the white spots on the whole smaller, the orange anal patch absent above, very rarely indicated beneath.

Hab. Assam: Khasia Hills (type); Naga Hills. North-West Burma: S. Chin Hills.

f. *D. belladonna hedybia* subsp. nov.

- Delias horsfieldi* Gray, Moore (err. determ.), *Lep. Ind.* vi, p. 166 (1894) (partim; Haundraw).
Delias belladonna Fabr., Nicéville, *Journ. As. Soc. Bengal*, lxiv, p. 487, sub no. 525 (1895); Bingham, *Fauna Brit. Ind.*, Butt. ii, p. 148, no. 577 (1907) (partim; Tenasserim).

♂ ♀. Smaller than *D. belladonna horsfieldi*, the anterior discal spots of the hindwing, above and below, smaller, particularly on underside, the orange anal area as large or larger than in *D. b. horsfieldi*, touching vein M^2 , the discal spot M^1-M^2 of ♀ washed with yellow. On underside the yellow cell-spot of hindwing reduced, smaller than discal spot M^1-M^2 , often quite small; submarginal spots of forewing and spots 3, 4, 5 of hindwing also reduced in size, yellow abdominal area at least as large as in *D. b. horsfieldi*.

Leads over to the next subspecies.

Hab. Tenasserim: Taoo plateau, 1,200 m., type, and Haundraw R. (Bingham). Also from the "Shan States" without more precise indication of locality.

g. *D. belladonna chrysorrhoea* Vollenh. (1865).

- Pieris chrysorrhoea* Vollenhoven, *Monogr. Pier.* p. 6, No. 3, pl. ii, fig. 4 ♂ (1865) (Sumatra).
Pieris chrysorrhoea (!) Vollenh., Kirby, *Cat. Diurn. Lep.* p. 462, no. 123 (1871).
Thyca (*Pieris*) *chrysorrhoea* Vollenh., Snellen, *Tijdschr. Ent.* xxxviii, p. 26 (1895) (Sumatra).
Delias belladonna Fabr., Nicéville & Martin, *Journ. As. Soc. Bengal*, lxiv, p. 487, no. 525 (1895).

♂ ♀. A small form, closely resembling *D. b. hedybia*, but the forewing less elongate. In ♀ the markings of the upperside washed with yellow.

Hab. Mts. of Sumatra.

h. *D. belladonna surprisa* Martin (1913).

Delias belladonna surprisa Martin, *Iris*, xxvii, p. 126, pl. vii, fig. 3 ♂, 4 ♀ (1913) (Central Celebes).
Delias surprisa id. l.c. xxxiii, p. 63, no. 70 (1919).

Not known to us. Yellow anal area above absent, beneath vestigial (♂) or absent (♀). Dr. Martin was much surprised when his native collectors brought him this insect. The name, too, is somewhat of a surprise.

Hab. Central Celebes : inland from Paloe Bay.

In *Ann. Mag. N.H.* (5), xvii, p. 161 (1886) de Nicéville, speaking of *D. belladonna*, says that there are three good species of this group : “ *D. belladonna*, West China to Kulu ; *D. sanaca*, Western Himalayas ; *D. belucha*, Beluehistan.” This *D. belucha* is evidently a slip ; de Nicéville probably had in mind *Aporia belucha*.
